

Center for Integrated Nanotechnologies

Sandia National Laboratories • Los Alamos National Laboratory



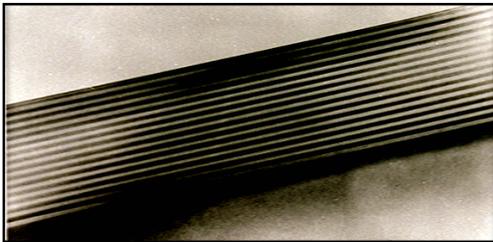
- Highly collaborative DOE National User Facility
- Focused on nanoscience and its integration across scientific disciplines and multiple length scales.
- Open access to tools and expertise to explore the continuum from scientific discovery to the integration of nanostructures into the micro and macro worlds.

“One scientific community focused on nanoscience integration”

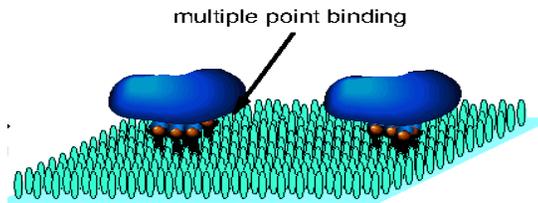


Integrated Nanotechnology will impact our world.

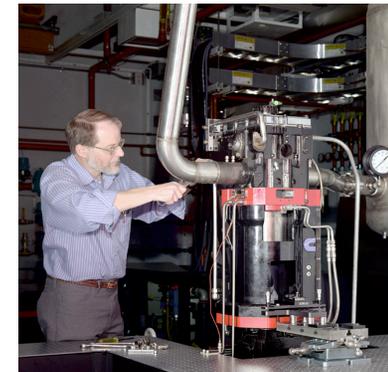
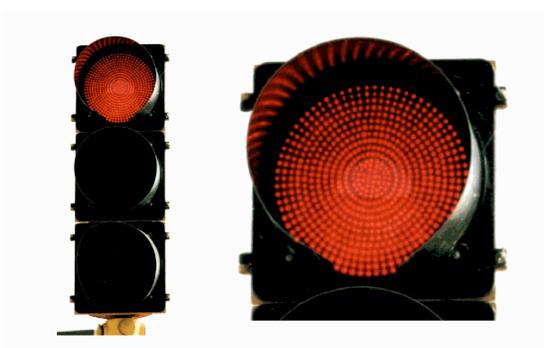
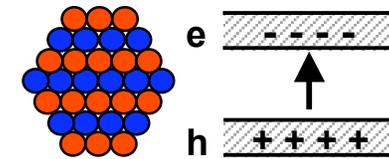
Energy



Security



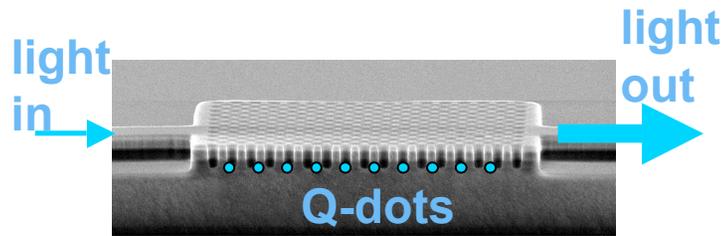
Environment



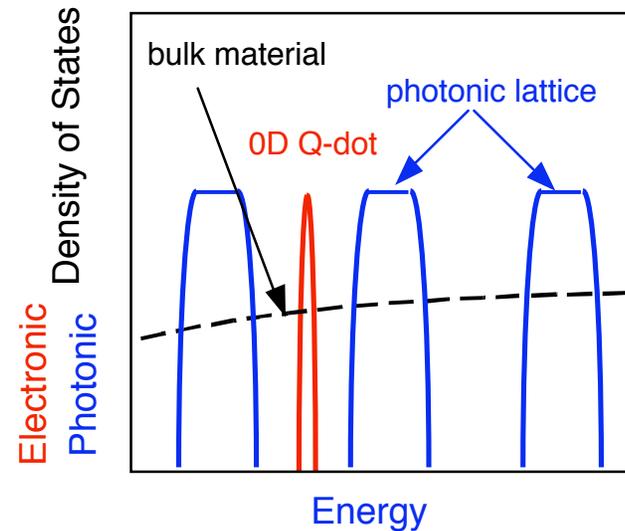
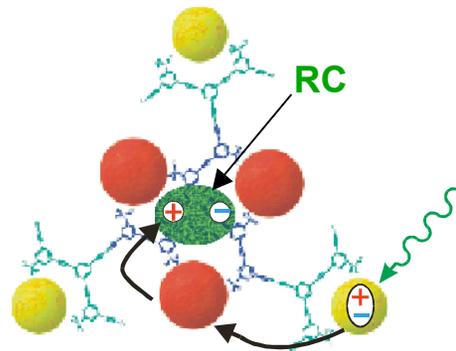
Connecting scientific disciplines and multiple length-scales is key to success



Integration Science Challenge: Energy transfer across multiple length scales



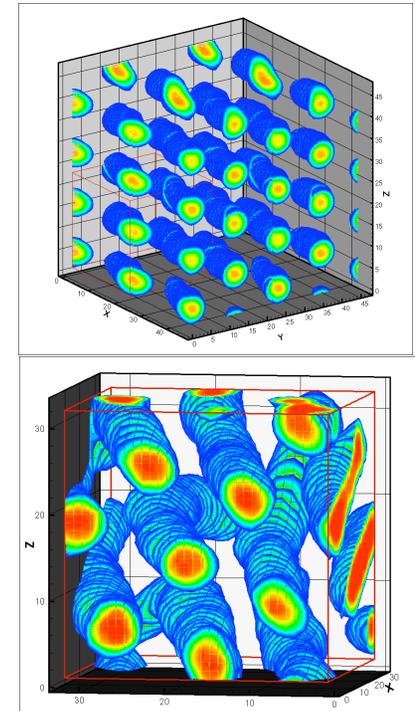
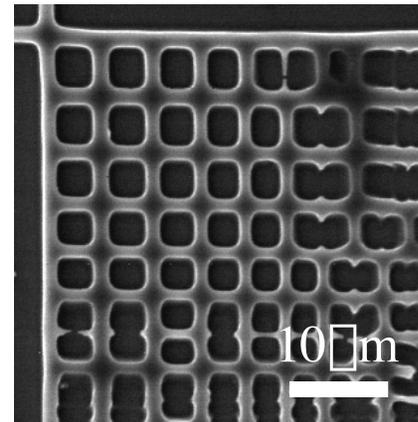
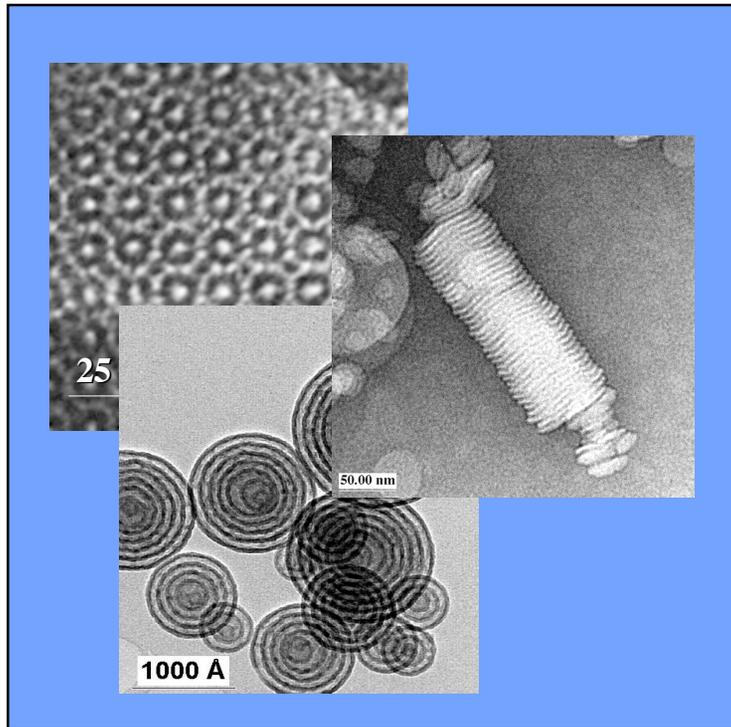
Optical amplification in QDs in 2D photonic crystals



Optical and electronic energy coupling across nano- and micro length scales can produce nonlinear response and new behaviors for switching and sensing.



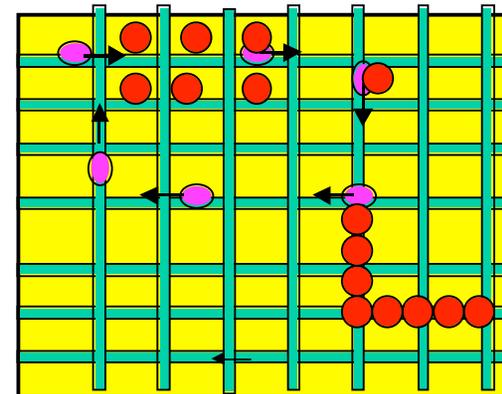
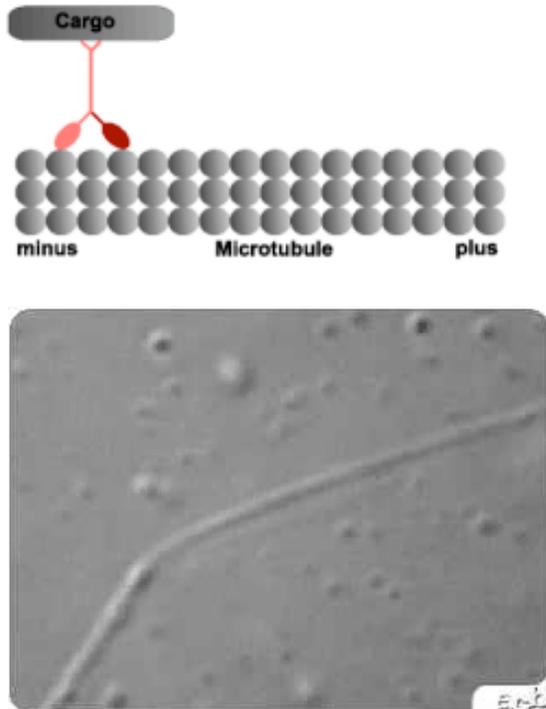
Integration Science Challenge: Combine top-down and bottom-up assembly



Micro- and macroscale boundary conditions and constraints can be used to manipulate and control nanoscale self-assembly processes.



Integration Science Challenge: Interfacing biological and synthetic systems

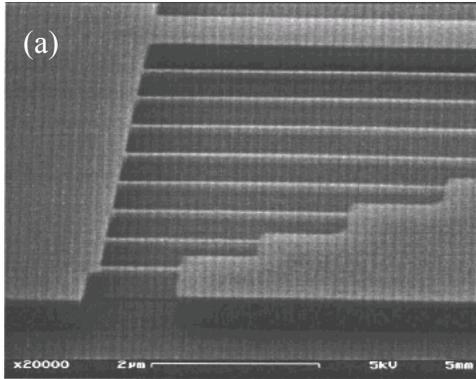


**From: Alberts et al. (1998)
"Essential Cell Biology."*

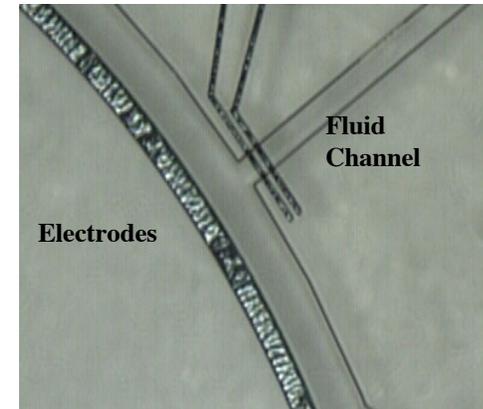
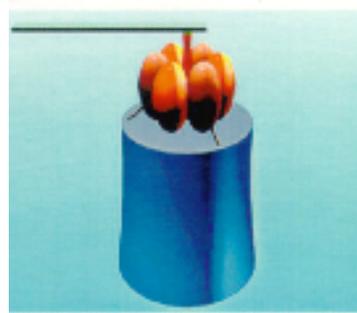
**Active assembly, healing, growth, reconfiguration, adaptation and degradation
of materials based on continually changing environmental conditions.**



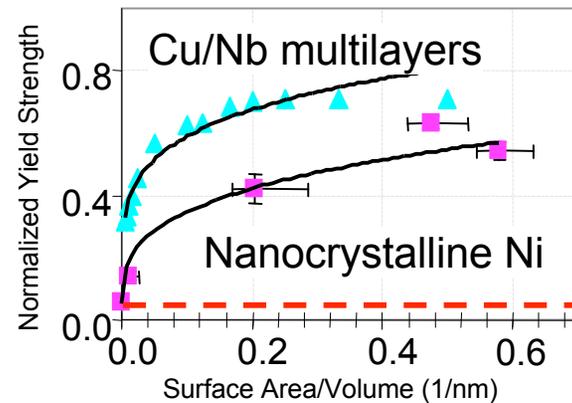
Integration Science Challenge: Mechanical force and fluid transport



Nanomechanics



Nanofluidics

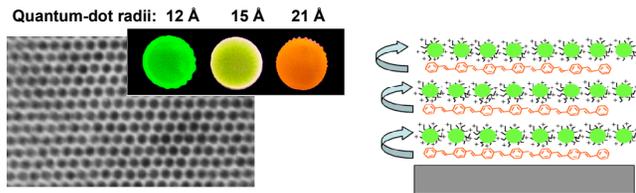


Super-hard metals

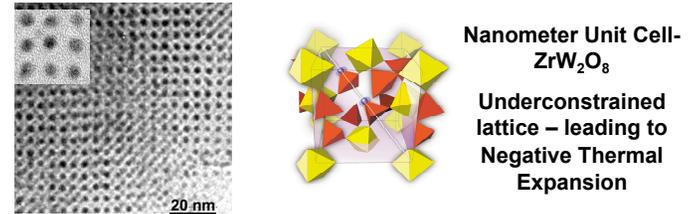


CINT Thrust Areas provide broad base of expertise.

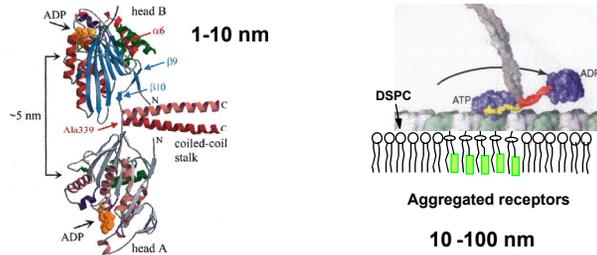
Nanoelectronics & Nanophotonics: Precise control of electronic and photonic wavefunctions



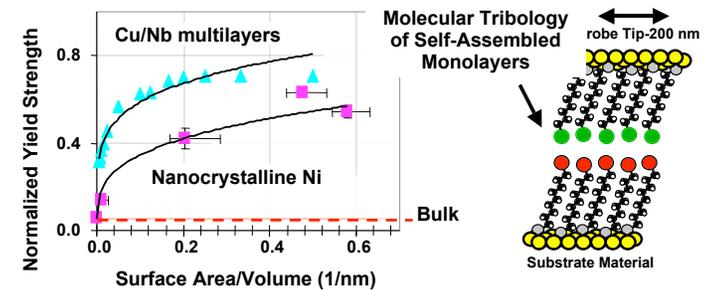
Complex Functional Nanomaterials: Relationships between synthesis, structure and complex and emergent properties



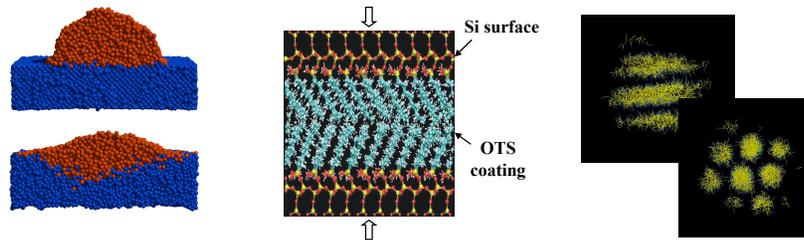
Nano-Bio-Micro Interfaces: Biological principles & functions imported into artificial bio-mimetic systems



Nanomechanics: Understanding the mechanical behavior of nanostructured materials

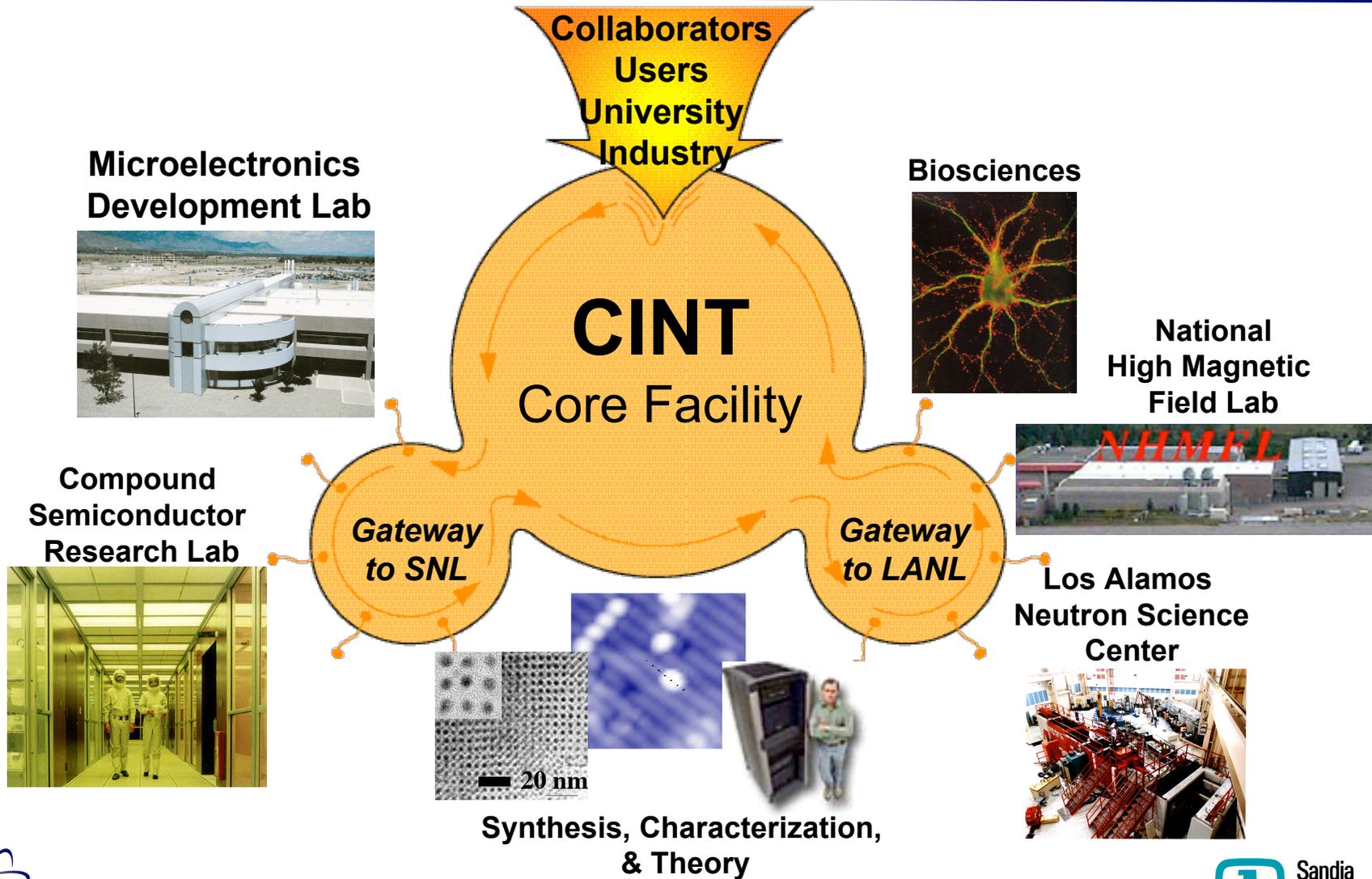


Theory & Simulation: Theoretical, modeling and simulation techniques for multiple length and time scales and functionality



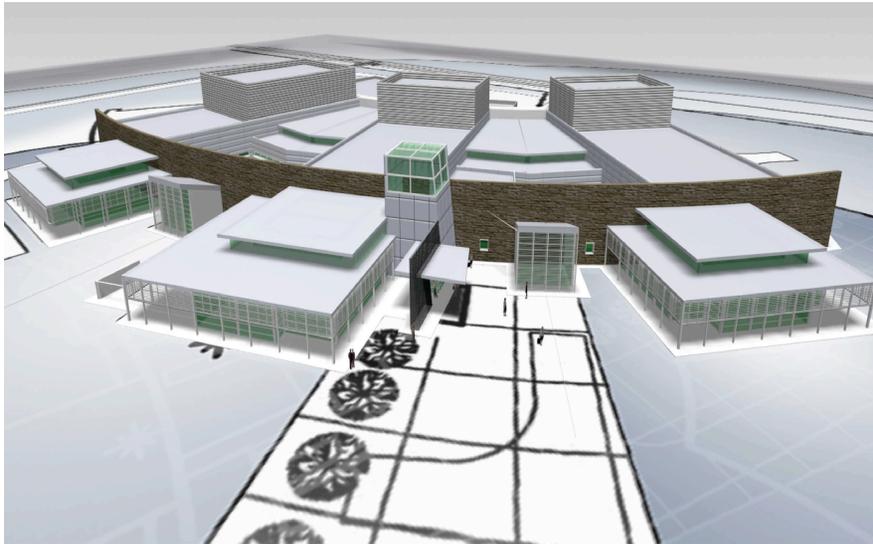


One community focused on nanoscience integration





Core Facility will provide common ground for collaboration and integration



Located in Albuquerque
Outside KAFB fence
93,000 GSF building size
Three experimental modules
Initial construction activities in FY03
Construction complete in FY06

- **Low vibration for characterization**
- **Chemical/biological synthesis**
- **Clean space for Integration**
- **Interaction areas**
- **Visitor office space**
- **High-speed communications**



Key laboratory assets available through Gateway Facilities

CINT Gateway to Los Alamos Nanomaterials/Biosciences



New Construction
31,000 GSF

Biosciences

- Cell Culture, Genetic Engineering
- Phage Display, Molecular Biology
- Imaging & characterization

Nanomaterials

- MRFM, fast NSOM&STM, TEM
- LANSCE, HMFL

Theory & Computing

Visitor Space

CINT Gateway to Sandia Nanomaterials/Microfabrication



Existing Space

Microfabrication

- CMOS, MEMS, NEMS
- MOCVD

Nanomaterials

- AT-STM, IFM, NSOM
- LEEM, TEM
- Nanocluster synthesis

Theory & Computing

Visitor Space



CINT Outreach and User Program

- **Universities**
 - Postdocs, students and visiting faculty/ researchers will comprise a major part of the user program.
- **Industry**
 - Propriety research proposal mechanism.
- **National and Federal Laboratories**
 - Other Federal labs and DOE NSRC facilities.
- **International Science Community**
 - Open to the international science community

Key Aspects of User Program

- **Open, no cost access to facilities based on scientific quality**
- **Spectrum of user modes**
 - **Access to equipment**
 - **Collaborative research**
 - **Grand Challenge Projects**
- **External evaluation of proposals**
- **Special help for first time users**
- **Mechanisms for proprietary work**
- **User program jump-start in FY03**
- **Full operating program in FY06**

User Workshop June 5 & 6

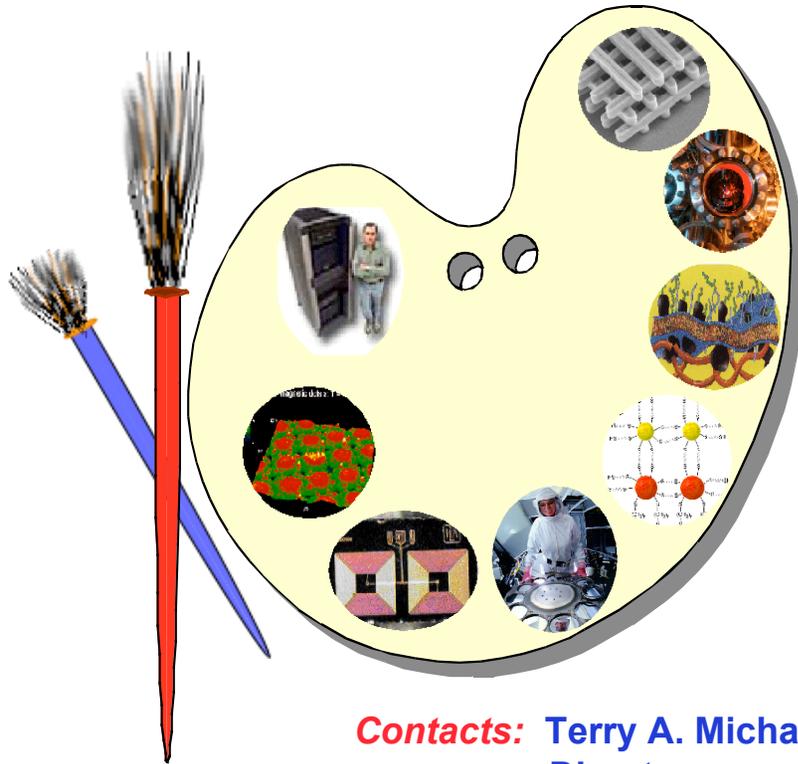


Jump-Start User Program

- **Jump-start user capabilities leveraged through existing programs.**
- **Initial call for user proposals April/May.**
- **User workshop June 5 & 6.**
- **Evaluations based on science quality, synergy with science directions, and available resources.**
- **First projects to begin late summer/fall '03.**
- **Proposal process / capabilities / laboratory contacts will be available on CINT website.**



A creative environment for new science and scientist



Dedicated Facilities

Clean rooms
Synthesis
Characterization

Access to National Laboratories

Microfabrication
Biosciences
Computing
Nanomaterials

No Cost Access

Peer reviewed proposals
University/Industry/Gov. Lab.

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Come join us!

<http://CINT.sandia.gov> or <http://CINT.lanl.gov>